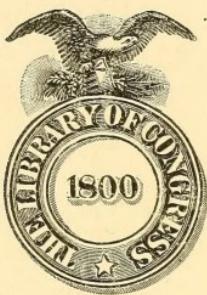


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The Value of **Sweet Clover**

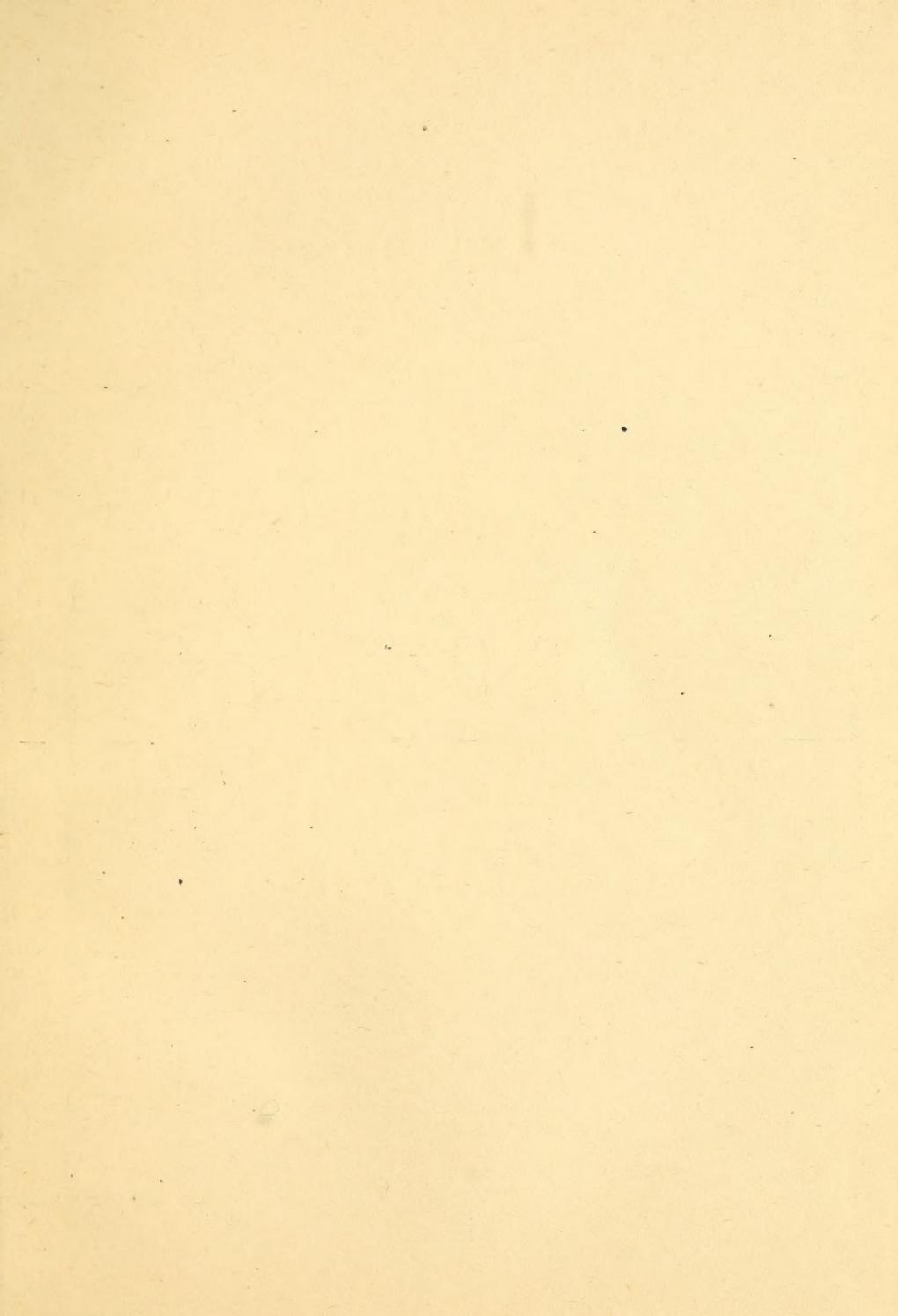


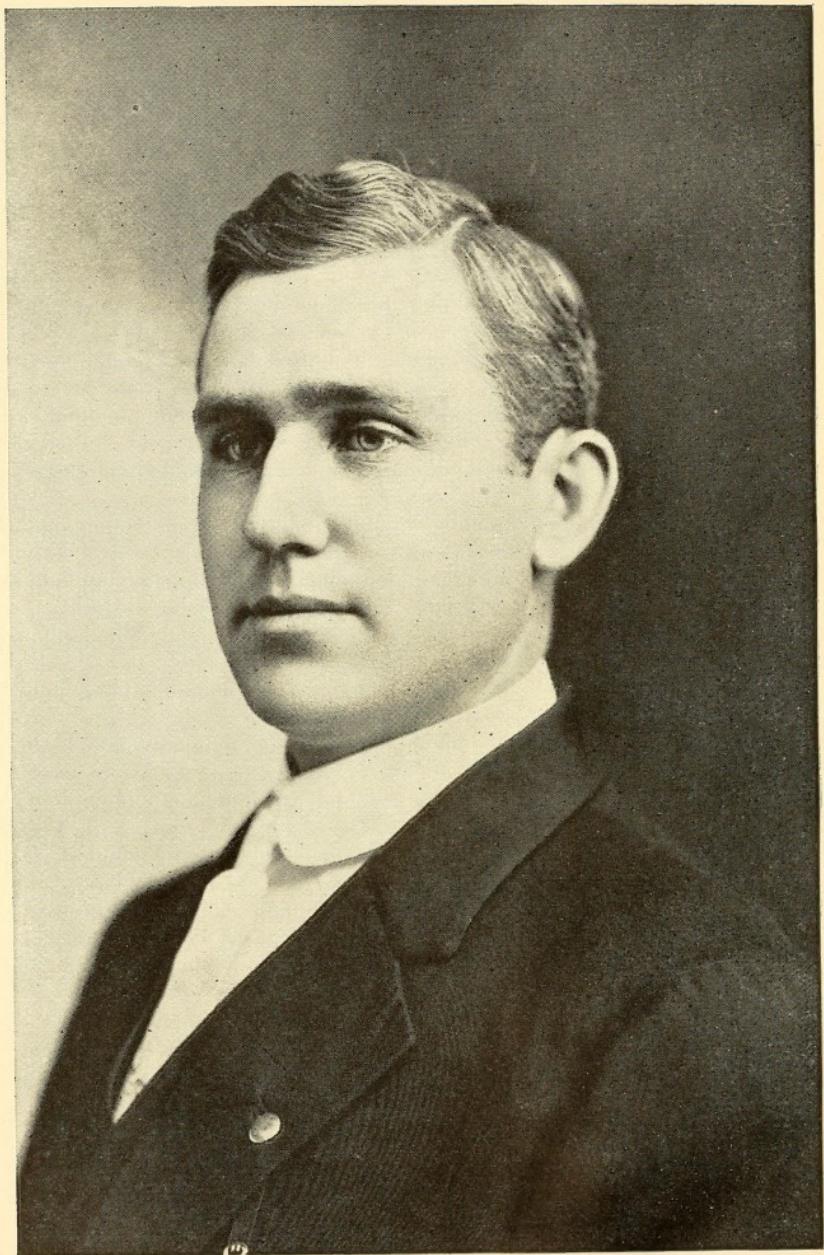
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J. K. Linn

The Value of Sweet Clover

By J. F. SINN
of
A. A. BERRY SEED CO.



PRICE, \$1.00

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Introduction

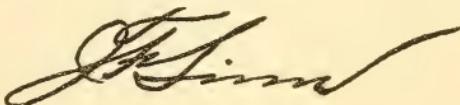
The idea in preparing this little book is to set forth in clear and simple language the main features connected with the growing of Sweet Clover; to exploit the value of the plant, so that its true value may be known, and to have Sweet Clover possess the place which was intended for it when created by the Almighty.

It is intended to convey useful information and suggestions that will be beneficial to the inexperienced grower and to those who are not acquainted with its merits and do not know of its value. There has been but little written of an authoritative nature concerning Sweet Clover. The author believes there is a place for this booklet in the library of every practical farmer who is interested in progress and is desirous of learning more about forage plants. From now on it is to the forage plant we must look to replace what has been robbed from the soil by constant farming and growing of other crops.

There is certainly a large field for Sweet Clover to fill, for every tiller of the soil appreciates the need of a restorative, as the soil is fast becoming depleted of its nitrogen and humus and requires rebuilding.

I realize there is a wide variation and difference in opinion as to the merits of Sweet Clover and all will not agree with the writer as to its value, although authentic tests have proven that it is on par with Alfalfa as a feed, and can be grown successfully over

a much larger area, as Alfalfa is rather a particular chooser of the kind of soil on which it will grow. In some instances Sweet Clover is being condemned, possibly because of not understanding the plant, while others are too enthusiastic and overestimate its worth, but the writer will feel that his efforts have accomplished the purpose intended if this book is the means of influencing individuals to test it out for themselves and to prove its value by experiments and observations.

A handwritten signature in cursive script, appearing to read "J. F. Linn".

Chapter I

HISTORY OF PLANT

Generally when speaking of Sweet Clover (*Melilotus Alba*), we have in mind the White Blossom variety, although there are four distinct species, which will be taken up later and each discussed. However, the White Blossom is considered for most purposes the most valuable, and when no qualifying term is used the white species is the one usually meant. The writer would ask that you bear this explanation in mind, as this understanding of the term is used in the following pages of this treatise.

This plant is known by a number of different names. The most common are Bokhara or *Melilotus*, which means honey lotus or honey plant. It is also called Bee Clover, Honey Lotus, Tree Clover and Giant Alfalfa.

While Sweet Clover is one of the oldest of the leguminous plants and from a careful study of the plant might be considered the most valuable, it is strange that not until recent years was its true worth discovered. The plant is a native of central Asia and has grown on the desert lands and mountain sides for over 2,000 years, growing luxuriantly, not being affected by the severe winters, nor by the extreme heat and drouth in summer. From there it spread to Europe, where for a number of years it has been cultivated to some extent for hay, pasture and as a fertilizer. It was also used somewhat in ancient times

for medicines, and in some instances this practice still exists to the present time.

The White Blossom Sweet Clover was first introduced in the United States in the early part of the eighteenth century by the colonists from Europe, but then little did they think that this honey plant, as it was called, would be the sensation of the twentieth century, so far as adding wealth to the agricultural industry is concerned.

Sweet Clover had always been considered a great honey plant and was utilized more in this respect than any other, although it was known to be of some value as a forage crop and fertilizer. It is now distributed more or less over the entire civilized world, and is sure to become the most popular plant of modern times. Its great value as a forage crop and fertilizer is being preached by all agricultural writers, and it has been greatly exploited by the best farm papers. Every up-to-date farmer has heard of, read or knows from observation something about Sweet Clover.

To those who are not acquainted with Sweet Clover it might seem that the value of the plant may be overestimated and that it is a fad or hobby which will pass by. It is not astounding that the true value of Sweet Clover was not discovered until the twentieth century, for this is the age when progress and inventions are being made in all lines. It would be a sad lot, indeed, for the tiller of the soil if no progress were made to aid him in the way of securing new crops or discovering further uses and values of different plants.

What has always seemed very strange to the writer is that the King road drag was not discovered sooner, for it certainly is a simple device and undoubtedly excells all machinery when it comes to making a fine dirt highway. As in all lines there is much wealth and latent power awaiting development; so it

is true in the agricultural pursuit that there is undoubtedly great wealth hidden and lying dormant in the soil. In all probability we shall from time to time learn some of the new things in plant life that will not only be a big surprise to us, but will add greatly to our already large number of paying crops. When one is seeking a fortune it is always well to look near at home, for often the hidden treasure is right at hand and only requires some one to bring it to light.

If you would speak of Sweet Clover as a weed you would cause no sensation, for it has been considered as such, and you will find it growing luxuriantly along the highways, railroad right-of-ways and many times in deep cuts where there is nothing but the yellow clay, in which it makes an unusual growth. It also makes a great growth along the irrigating ditches, and in this way has been spread rapidly; also by bee-keepers who have sowed it in various waste places.

There is no reason why Sweet Clover should ever have been classed as a weed, except that it is a prolific grower and is easily started, defies drouth and grows on nearly al kinds of soil. On account of its adaptability and persistency in growing it was classed as a weed by those who did not know of its commercial value; but this is the only characteristic of a weed that the plant possesses. And the very fact that it is so unusually hardy makes it all the more valuable as a forage plant, for no one need fail in growing it. The plant is a biennial and is not hard to eradicate and never becomes a pest, as it can be easily killed out by cultivation.

The utilization of Sweet Clover should be accompanied by a thorough understanding of its various characteristics, which are essential to know, in order to insure success with the crop and also prevent any

ill-effects which might result from growing it in ignorance.

Its value as a honey plant is quite generally understood, but this is the least important. Its great value as a fertilizer has not been fully understood, and it is going to bring an abundance of wealth to this country by increasing the fertility of run-down soils and reclaiming old, worn-out farms. It has been utilized for hay and pasture in a very limited way, for it has been treated as a weed, and possibly by mental telepathy the thought passed from the farmers' minds to the stock, as they also seem to have looked upon it as being unfit for food and refused to eat it when they have had access to other pasture. The reason stock refuse to eat it at first is due to a bitter taste and odor, but when once induced to eat it they apparently relish it and become very fond of it and prefer it to other forage. It has great feeding value, ranking right alongside of Alfalfa. In some respects it excels Alfalfa, its only rival, as a forage crop.

There is certainly a large field for Sweet Clover to fill, and it cannot help but be of great value to every farm and farmer, for there is not only a great need of a fertilizer in the south and east on the old worn-out farms, but there is also a great need throughout the entire corn belt. The plant does not only add wealth in the corn belt by supplying nitrogen and humus to the soil, but its greatest addition is its feed value. We have our great corn plant, rich in carbon hydrates, fat-producing element, but short on protein-bone, muscle and milk producing food. By combining Sweet Clover with corn we have one of the greatest feeding combinations known, and every stock raiser or dairyman will hail with delight the one thing for which he has been constantly searching. Every feeder and dairyman has been short in protein, and it has been expensive to obtain it by purchasing such feeds as bran, shorts, oil meal, clover and alfalfa hay.

The value of Sweet Clover as a protein feed will be better appreciated when you realize that a ton of it is equal to a ton of bran in food value, and it is claimed by some that in this respect it even excels Alfalfa.

It has several decided advantages over Alfalfa, which might be briefly mentioned at this time. First, and one of great importance, is that it is easily started, and this one fact recommends it to many farmers who have been unsuccessful in growing Alfalfa. It is also true that it is adapted to a wider range of soil and will thrive under conditions that Alfalfa would not. And, again, it withstands great drouth and does not winter kill. It will also produce more forage and is considered by the best authorities a better fertilizer. This does not mean that Alfalfa is not all that is claimed for it, but it now has a rival which bids fair to excel it in many ways, and it is to the interest of everyone to study both plants and know which one is best adapted to his specific requirements and decide which he ought to grow.

Chapter II

DIFFERENT SPECIES

There are three distinct varieties of Sweet Clover which are quite common in this country. In fact, four varieties are known to us, and in the old world there are still other varieties, but of little prominence. It will be well to take each variety up separately, in the order of their value, and give a short description, so that our readers may be familiar with their respective merits.

FIRST. White Blossom Sweet Clover (*Melilotus Alba*), is the most common and is the variety commonly referred to when merely speaking of Sweet Clover. Nearly everyone has seen this variety growing, for it is the one commonly seen along the highways, railroad right-of-ways and various out-of-the-way places, and when once started it grows very luxuriantly, if unmolested. It is a biennial (two-year plant), growing from a tap root and sends up an erect branching plant, with ascending stems not heavily covered with leaves. The first season, when sowed in the spring, it makes a growth twenty to thirty inches in height and reserves a large supply of food material in the root for a rapid and vigorous growth the second year.

Plants when young greatly resemble Alfalfa, but need never be confused with it, for it can be readily distinguished by the bitter taste and odor of its

foliage. The bitter taste it possesses is due to cumarin, but this is a decided advantage, as it prevents bloating when used for pasture.

When in bloom it is a very attractive plant, growing from five to ten feet high, and is generally covered with bees. The flowers are white, blooming in long, loose racemes, and a single seed is borne in a rectangular pod. After the seed is produced the plant dies.

In harmony with other legumes, it stores up nitrogen in the nodules of its roots, and this is the important element in adding fertility to the soil on which it is grown.

The seed very closely resembles Alfalfa seed, and cannot be easily distinguished, except by the odor which is common to Sweet Clover. Alfalfa is being used as an adulterant for Sweet Clover in some instances.

SECOND. Large Yellow Blossom Sweet Clover (*Melilotus Officinalis*), is very similar to the White Blossom, just described, but is not so common. Like the White Blossom Sweet Clover, it is a biennial, but does not grow as high, attaining from three to five feet in height. It is more spreading in habit and grows closer to the ground, making it often difficult to mow. This is an objectionable feature, for it leaves branches which produce seed, making it more difficult to eradicate unless cultivated. It blooms about ten days earlier than the White Blossom and grows a finer stem, and is preferred in some localities for hay on account of not growing so rank. The seed is very similar to the White Blossom, and it is difficult to distinguish them.

THIRD. Small Yellow Blossom Sweet Clover (*Melilotus Indica*). This species is a low-growing erect plant, blossoming very early in the season. This plant is supposed to have originally come from India. It is an annual, while the two preceding species are

biennials, and are far more important. This plant is only grown in a limited way in the United States, flourishing mostly in southern California, where it is considered of value, but is not recommended for sections where the other varieties can be grown advantageously.

It is a legume, the same as the other varieties, but is not recommended, for it contains more cumarin, making it very bitter and less palatable for stock of all kinds.

However, it is very essential that you become familiar with this variety, and on this account one should know the difference. Several seed dealers have been imposed upon during the past few years, for the annual has been substituted for the large yellow blossom, which is a biennial, and is not to be compared with the annual in any way. The seed of the small annual Yellow Blossom species has a rough surface, while the large biennial are smooth. The Seed Laboratory of the Department of Agriculture, Washington, D. C., is prepared to identify samples. Anyone who wishes the Large Yellow Blossom variety should be particular about purchasing their seed from a reliable party, who knows what is being offered.

FOURTH. Blue Blossom Sweet Clover. There is a variety that has a blue blossom, but it is not common in the United States and is not generally considered. It is supposed to be a native of Africa and is very similar to the Large Yellow and White Blossom varieties, being a biennial and in general appearance resembles them, except the color or blossom. It grows to a height of three to five feet, and is an erect branching plant, easily eradicated by cultivation.

Chapter III

WHERE IT WILL GROW

It has been generally stated that Sweet Clover is being grown in all civilized countries, which is true, and it is also being grown in all parts of the United States. It possesses a wider adaptability as to soil and climate than any of the other leguminous plants, growing successfully in the sub-tropical climates and also enduring the wide range of temperature to which it is subjected throughout the Northern States and Canada. Sweet Clover thrives in the most humid sections, and will withstand a great amount of moisture and very unfavorable conditions, such as overflow, and in this respect is about equal to Alsike; it also thrives in the semi-arid regions, where the rainfall is very limited and not over half of what is required to produce a Clover crop. On the "acid" soils which are found in the Eastern States it grows very satisfactorily, and when planted on such soil it has a tendency to counteract the acidity and put the soil into shape for growing other plants which would not thrive before. We also find it growing on the alkali soil of the Western States, where alkali would prevent raising other farm crops. It grows on very thin, sandy soil, and on the gravelly hills which are too poor to produce any other crop advantageously, and you also find it growing in the limestone quarries. It thrives exceedingly well on the limestone hills in the East, which will not produce other crops. You will

find it making a luxuriant growth on the clay banks of deep cuts and has also been noticed growing on blue clay taken from the bottom of a well. In fact, it will grow on all kinds of soil, with the exception of low, wet ground which is water logged, but even in this respect it grows on very wet land, and has a tendency to relieve the boggy condition. It makes a splendid growth on the rich black loam, and also on the black gumbo commonly found on bottom land. The only other exception is soil which has been completely depleted of lime. Sweet Clover requires lime in the soil, and this mineral has been well provided by nature and nearly all soil contains sufficient lime to insure growing it successfully. It is a great drouth resisting plant, and this undoubtedly is due to the fact that it sends out a long tap root, making a great root growth the first season, and stands the long, hot, dry summers of the Southern States better than Japan Clover or any of the other forage crops. It also withstands the hot, dry summers of the western plains, remaining green and making a splendid growth, despite the hot, dry weather which is so disastrous to all kinds of plant life.

Sweet Clover is a wonderful plant, growing in so many different climates and conditions, and we wish to give what the Farmers' Bulletin, No. 485, of the Department of Agriculture, has to say on this point: "It thrives in the most humid parts of the country, as well as in the semi-arid sections, where the rainfall is but three-fifths of that required for the normal growth of such crops as Timothy and Red Clover. It produces satisfactory crops on the "acid" soils of the Eastern States and also on the alkali soils of the West, where sufficient alkali is present to prevent the growth of most farm crops. It will grow on soils too sandy to support ordinary field crops, and appears to be even better adapted to raw clay and loose cuts and fills, where scarcely any other vegetation is able to establish a foothold. It also makes an

excellent growth in gravel pits and stone quarries, but for some reason does not seem to do well on unsettled, cultivated soil. It makes its best growth where the soil is compact and not crowded with other vegetation. In such states as Iowa it seems to require a rich soil for satisfactory growth, but on the limestone hills of the Eastern and Southern States it makes a good growth on soils too poor to produce a paying crop of corn."

From all reports received from the best authority it would seem that Sweet Clover has a wider range of adaptability not only in latitude and soil, growing in the extreme North, to the extreme South, but also possesses great endurance and thrives without rainfall and not only withstands moisture and defies drouth, but has the same endurance when it comes to heat or cold. The fact that Sweet Clover is adapted to such a wide range of soil and conditions recommends it as one of the most important of the leguminous forage crops and makes it a valuable plant on account of not being able to grow other crops where it thrives.

Sweet Clover is being grown quite extensively as a field crop in Alabama, Mississippi and Kentucky, and is proving equal to its reputation as laid down by scientific agricultural writers, and is bringing an abundance of wealth in the way of renewing the depleted fields which have been farmed to death. You will also find Sweet Clover growing in Iowa, Nebraska, Illinois, Indiana, Missouri, Wisconsin, Utah, Wyoming, Montana, Dakotas, New York, and, in fact, nearly every state in the Union is growing Sweet Clover to some extent. The demand is rapidly increasing and every up-to-date, wide-awake farmer is interested in the plant and is making investigation as to its merits, and in many cases is testing it out in a small way. It is really amazing to note what interest has been manifested, and consequently there has been an unusual demand for seed. Last year the demand

exceeded the supply and many were unable to obtain seed, while others who were so anxious to give it a trial secured Yellow Blossom instead of the White, for it seemed more plentiful, but much the Yellow Blossom Sweet Clover offered was the annual, and in such cases Sweet Clover undoubtedly got a setback, for the annual is not to be compared with the White, and it is essential that the correct species be used if you desire success.

Chapter IV

TIME OF SEEDING

This is a question which might have several answers and all be correct, for in different parts of the country a different time might be best suited. So it is with any given rule. There are exceptions, but going back to nature we find the seed is left on the ground in the fall, and it germinates for the most part in the spring, there being an occasional plant started in the fall. Spring seeding, generally speaking, has given excellent results and is considered the correct time for sowing.

The best time in the spring for sowing depends somewhat upon how the crop is to be handled and whether it is to be sowed with or without a nurse crop. When using a nurse crop it should be sowed early in the spring at the time that Oats and Barley are sown, and the earliest varieties of small grain makes the best nurse crop. One of the greatest mistakes in seeding grass seed of all kinds with a nurse crop is using too much seed and trying to raise a full crop of grain. The grain should be considered as a secondary crop and the grass seeding, no matter of what kind, should be considered first, for it is the most important. It is mere folly to smother out your seeding of Clover, Alfalfa or Sweet Clover by sowing three or four bushels of Oats per acre, endeavoring to raise a bumper crop of Oats, as well as securing a stand of grass. The talented editor of Wallace's

Farmer, Uncle Henry Wallace, in making a short talk in regard to the methods of seeding, stated that this was the greatest cause of not obtaining a stand and that in his long experience of seeding, when a proper amount of grain seed had been used, he only knew of two or possibly three failures, these being due to the extreme dry season.

Now, when using Oats as a nurse crop, it is best to select the earliest varieties and sow not over one and one-half bushels per acre. One reason for recommending an extremely early variety of Oats when sowing Sweet Clover, is on account of Sweet Clover being a very rapid grower and by harvest time it will be up ten or twelve inches, and will gather in the butts of the bundle, unless the stubble is left quite high to avoid it.

Sweet Clover is also sowed in the spring, without a nurse crop, by preparing the soil and sowing in the same manner as Alfalfa or Common Clover. There is no particular advantage in sowing without a nurse crop, for the plant will make about as much growth with a nurse crop and except in the South you cannot secure more than one crop the first season. The plant will continue to grow throughout the entire season and can be pastured in the fall, or a hay crop may be cut the latter part of September or the first part of October. By using a nurse crop you can accomplish practically the same results, besides harvesting a fair crop of small grain, but always remember not to become too greedy and sow too much small grain, for the main crop might be lost by doing so.

Fall seeding is desirable in some section, but for the most part the writer does not recommend it, for it has some disadvantages, and throughout the corn belt spring seeding undoubtedly will prove far more satisfactory. When seeding in the fall the seed should be sown the latter part of August or the first of Sep-

tember on ground that has been well prepared and a good seed bed obtained. Sweet Clover when seeded in the fall does not make enough root development to start off properly in the spring and the growth of the plant is reduced somewhat. This disadvantage will prevent fall seeding being very popular, and, again, it is not best to cut a hay crop late in the following fall, although it may be pastured lightly, but not close to the ground. In the Southern States fall seeding is more popular than in the North, but in the corn belt and Eastern States spring seeding is preferable.

Chapter V

PREPARATION AND AMOUNT TO SOW

Those who are familiar with growing Alfalfa should not have much trouble in starting Sweet Clover if they remember that the plants are very similar. The main thing is a well prepared seed bed which is firm and solid (and there is little danger of getting the ground too firm or solid), for the firmer the better stand will be secured. All the loose soil required is enough to enable you to thoroughly cover the seed. Sweet Clover has failed quite frequently when sown on a cultivated field, and failure was due in all probability to not having a compact seed bed. The fact that it requires a solid seed bed is further demonstrated by its growing successfully on hillsides where nearly all the soil has been washed away and on the roadsides where the ground has been tramped and is very solid. It is very essential that a solid seed bed be prepared, but good results have been obtained by seeding in the same manner as Common Clover. It sometimes is sowed in Winter Wheat early in the spring without any further preparation and a good stand is obtained.

Sweet Clover does well following a corn crop when sowed in the spring, and works in to good advantage for rotation. The ground can be properly prepared by disking and harrowing, and by either seeding broadcast or by drilling fifteen to twenty pounds of seed, or ten pounds to twelve pounds of

scarified seed, to the acre, there should be no trouble in obtaining a stand. It may also be sowed with a nurse crop without any further preparation than what you give to seeding of the small grain. If you use a drill in sowing your small grain and it has a seed attachment you could drill in the Sweet Clover, although fully as good results may be obtained by sowing broadcast. Land which has been fall plowed would not be so desirable for spring seeding as stock land, for the soil would not be solid enough to insure success.

For the best results Clover sod no doubt would prove the most successful. By fall plowing Clover sod and disking the same as preparing for a corn crop and getting the ground in good condition for early seeding there is no reason why a very heavy crop of Sweet Clover could not be grown. On such land it might be well to sow without a nurse crop if you were very desirous of getting all you could out of the Sweet Clover crop, for it will make a little faster and heavier growth when sowed alone and by fall you would get quite a heavy hay crop.

The preparation of the seed bed for fall seeding is more difficult than spring seeding and should be handled in about the same way as Alfalfa. It would require plowing several months before seeding and much surface cultivation, forming a compact seed bed with a mulch on top to cover the seed. If you wish to seed Sweet Clover in the fall following a small grain crop it is difficult to get the grain off in time so as to plow and work down a solid seed bed, and in such cases better results may be obtained by simply disking the stubble and getting enough loose soil to properly cover the seed. It is not practical to plow the ground early in the season and work it until the first of August, in order to sow Sweet Clover; nor is it necessary, for spring seeding would be more desirable, and there is very little to be gained by waiting

until fall, and if it is possible to sow in the spring it should be done at that time.

The amount of seed required for an acre varies according to what is desired from the crop; also upon the germination test of the seed. One recognized authority in Sweet Clover says: "The amount of seed required per acre depends whether sown for hay, pasture, green manure, or for restoring worn or waste lands. On account of it stooling out so heavily, a medium stand the first year will become a thick stand the second, when it comes from the roots, and a heavy stand for the first year will be entirely too thick the second year to obtain a normal growth and development of the plant. For hay a bushel will sow three acres; for green manure a bushel will sow two acres, if to be plowed under the first year and three acres if to be plowed under after the second year's growth."

In testing Sweet Clover it is oftentimes found that there is a large per cent of hard seed which will not germinate until the second year, and sometimes not until the third season. Southern seed is found to contain a larger per cent of hard seed than any other, and the imported seed the smallest per cent. This may be partly due to most foreign seed being one year old or due to other conditions. Ten pounds of seed would be a great sufficiency for one acre if it would all grow. It is necessary to count on part of it not germinating, at least the first season, and fifteen to twenty pounds of hulled seed is found to be about the correct amount, although some writers recommend as much as twenty to thirty pounds to the acre. Ground which is adapted to growing Sweet Clover, or which is thoroughly inoculated undoubtedly would require less seed if unhulled seed is used is required about five pounds more seed per acre. The experience of the writer has been that hulled seed gives the best results and it is more desirable.

The complaint of seed not germinating properly is a point which is fully covered by the Farmers' Bulletin and a remedy given which is of great interest and is herewith given in full: "A lesser weight of seed would be sufficient were it not for the fact that often one-half of the seed has such hard seed coats that it does not germinate the first season and therefore is practically useless. This retarded germination of the hard seed can be overcome by soaking the seed in commercial concentrated sulphuric acid for half an hour. It should then be quickly washed, using running water, if possible, as sulphuric acid becomes very hot when mixed with a small proportion of water. A great deal of water is therefore necessary in order to lessen the danger of burning. The seed should then be dried off quickly by spreading it out on a floor or canvas and stirring at intervals."

The acid corrodes or eats away the hard, impermeable seed coat sufficiently to enable the seed to absorb enough moisture to germinate. This method has been investigated by Prof. H. L. Bolley of the North Dakota Agricultural Experimental Station. Tests made in the Department of Agriculture gave an increase in germination of 40 to 45 per cent. Great care must be exercised when working with sulphuric acid, as it burns the flesh and any wooden objects badly, and is especially dangerous to have around in the presence of children. The vessels used for treating the seed should be of earthen or enameled ware to prevent corrosion by the acid. After the seed is treated it should be preferably sown promptly, as it has a tendency to dry out after the coat has been eaten off by the acid, but it can be held for two weeks or a month under favorable conditions without any considerable deterioration. This method is still in the experimental state, and many details presumably remain to be worked out in actual practice. The imported seed is always hulled, while that grown in this

country may not be hulled, owing to the fact that it is often gathered by hand locally and usually in a quantity too small to make it practicable to have it run through a huller. When starting a permanent pasture it is best to seed two years in succession at first, in order that there may be a number of 1-year-old plants ready to take the place of the 2-year-old plants, which mature seed and die.

Hard seed is present in nearly every sample, but is more abundant in southern-grown than in northern-grown seed. In commercial samples the proportion sometimes runs as high as 90 per cent, the lesser proportion in imported seed than in either the native northern or southern-grown seed is possibly due to the fact that much of the imported seed is more than one year old. Table 1 shows the percentages of hard seed found in samples of Sweet Clover from different sources.

TABLE 1. Percentages of hard seed found in Sweet Clover from different sources.

| SOURCE OF SEED | No. of Samples | AVERAGE PER CENT | |
|----------------|----------------|------------------|-----------|
| | | Germination | Hard Seed |
| Southern | 60 | 22 | 14 |
| Northern | 43 | 22 | 37 |
| Imported | 12 | 28 | 56 |

Chapter VI

TREATMENT OF HARD SEED

The low per cent of germinating seed in Sweet Clover has been a serious problem to overcome, but this has been largely taken care of by the invention of a machine which successfully treats the seed and by the use of it the germination is increased as much as 50 per cent and in some cases the germination has been reported increased from 10 per cent to 90 per cent.

The low percentage of germination in Sweet Clover seed is caused by the large percentage of hard seed. Hard seed have dense or thick seed coats, which prevent the proper absorption of water even when placed under perfect condition for germination, and hence, when planted in the field, they are unable to grow immediately. It is generally agreed that hard seed are worthless so far as their value for producing a stand under general field conditions is concerned. In various tests, hard seeds have been planted under ideal conditions for germination for months and even years without growing. Numerous tests conducted by botanists and agronomists of the United States show that the seed coats of a considerable portion of the hard seed will gradually soften and that they will germinate after several weeks, months or years, but not in time to be of any practical value to the farmer.

The greatest care should be exercised in buying Sweet Clover seed as the germination is often uncer-

tain and the seed high in price. Buyers are apt to judge the quality, probable germination, by color and appearance of seed. Often very fancy-appearing seed is low in germination due to the hard seeds, and it is due to this fact that you should insist on knowing whether the seed has been treated by a scarifying machine. Sweet Clover, which promises to become one of the most important legumes, is noted for the large number of seeds which are hard. Very few samples of Sweet Clover will germinate more than 50 per cent before being treated. Many farmers are now buying and using sweet clover as a farm crop, and are annually expending thousands of dollars in purchasing seed, sowing from 20 to 25 pounds to the acre, when half this quantity of high-testing scarified seed would answer and give better results.

The Experimental Station Reports

A large number of duplicate seedings were made on the experimental station field during the past season comparing treated and untreated Sweet Clover seed. These were sown on adjoining plats so as to provide as near as possible identical growing conditions. Stands which were, if anything, too thick were secured after the seed had been treated, while the same seed, when not treated, failed entirely in producing a stand. An Illinois farmer, for whom the Farm Crops Section treated approximately 3,000 pounds of seed, states in a letter that seed which germinated only 50 per cent when sent to Ames, germinated 98 per cent when returned. An Iowa farmer, who used some of this seed, secured a perfect stand by using only five pounds of the treated seed per acre instead of the usual 20 to 30 pounds of untreated seed per acre.

When you consider the increase in germination and the fact that scarified seed is much surer of making a stand, it is not wise to use any seed but the best-

treated stock. The A. A. Berry Seed Co. have installed one of the latest and most efficient scarifying machines on the market and are in position to furnish their customers with scarified seed at all times. They have given much study to the Sweet Clover seed proposition and are well versed on the methods of growing and nature of the plant, and for this reason are well prepared to take extra good care of their customers. The writer wishes to emphasize the importance of using scarified seed and would advise sowing no seed that had not first been treated.

SOME TESTS BY AMES COLLEGE ON SCARIFYING SEED.
Showing Its Effectiveness as Measured by the Germination of Treated
and Untreated Sweet Clover Seed.

| Date of Test | Kind of Seed | Germination Before Treating | Germination After Treating Once |
|--------------------|--------------|-----------------------------|---------------------------------|
| Dec. 18, 1913..... | Hulled | 36 | 92 |
| Dec. 20, 1913..... | Hulled | 37 | 95 |
| Dec. 20, 1913..... | Unhulled | 9 | 95 |
| Dec. 20, 1913..... | Unhulled | 9 | .. |
| Dec. 24, 1913..... | Hulled | 37 | 90 |
| Dec. 24, 1913..... | Hulled | 37 | 95 |
| Jan. 15, 1914..... | Hulled | 35 | 93 |
| Jan. 15, 1914..... | Unhulled | 10 | 89 |
| Nov. 7, 1914..... | Hulled | 37 | 80 |
| Nov. 7, 1914..... | Hulled | 37 | 94 |
| Dec. 25, 1914..... | Hulled | 37 | 95 |
| Dec. 25, 1914..... | Hulled | 37 | 96 |
| Dec. 25, 1914..... | Hulled | 37 | 94 |
| Dec. 25, 1914..... | Hulled | 37 | 93 |
| Dec. 25, 1914..... | Hulled | 37 | 93 |
| Dec. 25, 1914..... | Hulled | 37 | 96 |
| Dec. 25, 1914..... | Hulled | 37 | 96 |
| Dec. 25, 1914..... | Hulled | 37 | 96 |
| Jan. 22, 1915..... | Unhulled | 36 | 89 |
| Jan. 22, 1915..... | Hulled | 50 | 97 |

Chapter VII

INOCULATION AND FERTILIZATION

All leguminous plants require inoculation to insure the best growth. However, this does not mean that it is always necessary to inoculate the soil before seeding, but quite the contrary, for in most cases the soil already is sufficiently inoculated so as to produce satisfactory results. Where you already find Sweet Clover growing along the roadside in all probability the fields nearby are inoculated, so that the plant will grow successfully. In sections where Clover and Alfalfa grow successfully you can assume that Sweet Clover would grow without any further inoculation. Alfalfa and Sweet Clover require the same bacteria, so that Alfalfa land is properly inoculated for Sweet Clover and vice versa. Sweet Clover is now often used for the inoculation of fields, preparatory to sowing Alfalfa. And where Alfalfa will not grow successfully Sweet Clover is a splendid crop to grow to inoculate for Alfalfa, as it not only inoculates the soil, but has a large tap root, which makes a vigorous growth, and has a tendency to break up the compact sub-soil which in many cases is the cause of Alfalfa not doing well, and thus making it dwindle and die out after the first or second year.

There are two ways of inoculation, one known as the soil-transfer method, and the other the pure-

culture method. The inoculation by soil-transfer method is the most commonly practiced, and also is the most satisfactory. This method is very simple and is not difficult to follow, although it is a little more laborious and there is one objection which should not be forgotten, and that is to get soil which is free from noxious weeds, insect or plant enemies, for you might introduce some pest on your land which would be hard to exterminate.

In order to inoculate by the soil-transfer method it is necessary to secure soil from a good, healthy Sweet Clover field or from the roadside where it may be found growing, or from an Alfalfa field. It requires about 200 to 400 pounds of soil to the acre, which should be scattered over the field just before seeding, and after the soil is scattered it should be immediately covered by harrowing, for the sun's rays will kill the bacteria germ if left exposed for any length of time. The soil, if fine, can be sowed broadcast by hand, or with an end-gate seeder, or it may be put on the ground with a manure spreader. Another way which might be very practical is to fasten a long narrow box on the front of the harrow, with a slat bottom, leaving openings sufficiently large so that the soil may scatter out, thus distributing the soil and harrowing it in at the same operation. The soil could also be put in the field with a drill that has a fertilizer attachment. It is also suggested that it would be a good plan to take a small portion of the soil and mix with the seed at the time of sowing, but this is not necessary if the soil has been well distributed before seeding.

If it is difficult to obtain soil and it cannot be procured to advantage, except in small quantities, this plan may be followed: Take equal parts of seed and soil and dampen the seed and scatter it out on a smooth surface and scatter the soil over the seed by sifting and the dampened seed will catch the soil and as soon

as the seed has dried sufficiently to sow it should be seeded.

The pure-culture method is more easily done than the soil-transfer method and it has the advantage of preventing the introduction of harmful weeds or pest on the farm and is now recognized as the most practical way of inoculating. The culture is manufactured at different places and can be secured from nearly all seedsmen, and full directions are given with each bottle or package. The nodule germ manufactured and sold by the A. A. Berry Seed Company is one of the best cultures on the market and is very reasonable in price, and is to be recommended. The culture comes in a liquid form generally, and when using it dilute the culture with a sufficient quantity of water and then mix thoroughly with good, clean soil, which may be taken from the field you intend to sow and the treated soil is handled in the same manner as when inoculation is made by the soil transfer method. Culture is also used in inoculating the seed where no soil is used. The culture is prepared according to directions given with it, and the seed is moistened with the culture, so that each seed is affected, but care should be used not to soak the seed. As soon as the seed is sufficiently dry for handling it should be planted. You should not wait any great length of time, for the nodule bacteria will soon die. Seed which has been treated should never be exposed to the rays of the sun when drying.

The matter of fertilizing the soil before sowing Sweet Clover is a point of little importance, for it has already been found that it will grow on the poorest soil; also on the limestone hills and quarries, in the sand and clay, but like Alfalfa in this respect it will make its best growth on good, rich soil and when it has access to plenty of moisture. The fact that Sweet Clover is such an excellent fertilizer in itself there is little need of applying any commercial fer-

tilizer. It would be far better to grow Sweet Clover on the thin, worn-out land and build it up with the plant and then apply the fertilizer on the soil in connection with the crop which is to be grown following the Sweet Clover. Just what fertilizer would be best to use in connection with Sweet Clover is hard to say, for there have been but very few tests along this line. It, however, is necessary to have some lime in the soil to grow it successfully, although it is growing on soil which is very deficient in lime and does not contain sufficient to grow other crops to advantage. If you wish to grow Sweet Clover on soil which has been depleted of lime, or in fact worn out, not cropped out, for in this case it is a matter of restoring nitrogen, which the plant itself will do, but if depleted of lime it would be well to use lime as a fertilizer, the quantity depending upon the soil.

The matter of fertilizing is little known to the western farmers, for the rich soil in the Mississippi and Missouri valleys has produced such excellent crops and has withstood constant farming, so that they do not feel the need of fertilizer. However, with the Eastern and Southern farmers it is different, for they contemplate the use of fertilizer with nearly all crops. Sweet Clover will be a great boon to them in this respect, for they will be able to build up their land cheaply and at the same time harvest large, paying crops, which will add wealth to the country.

Chapter VIII

VALUE AS A HAY CROP

Sweet Clover may be utilized as a hay crop, for it makes a valuable feed for all kinds of stock, and as it is a heavy producer it will prove a splendid forage crop for this purpose. In the North, where Sweet Clover is seeded in the spring, you can make one cutting of hay about the first of October. The first year it will make a growth from twenty to thirty inches, and as it does not seed the first year it will make a very heavy growth of from twenty to thirty leaves, and it also makes an unusual root development, sending the tap root down as much as four feet. In this root it stores a large amount of reserve food material and makes a very vigorous growth the following season.

In the South, where the seasons are longer, two cuttings can be made the first year, but in most parts of the country only one cutting is expected. In the Northern States the first crop is cut at about the time we begin to have frost, and a slight frost will do no damage to the quality of the hay. When mowing in the fall it can be cut close to the ground, with no bad effects, for it will not winter kill and will come forth early in the spring and start with a rapid growth.

The hay should be cut when there is no dew on the plant, for the plant is of a succulent nature and

is rather difficult to cure. It is considered a little harder to cure than either Clover or Alfalfa, and care must be used in properly curing the plant if the most is to be gotten out of it for feeding. The best way to cure after cutting and allowing it to wilt is to rake it into large windrows and allow it to cure in the windrow, but if in doubt about the advisability of leaving in the windrow more than a day it may be put into shocks and allowed to stand until properly cured for stacking or putting in the barn. It would be well to put it into small shocks, so that when loading them on a wagon they could be lifted intact by the pitchers.

It is not difficult to cure Sweet Clover in the shock, and if the weather is unsettled it may be cut in the morning, after the dew is gone, and put in the shock the same day. If the shocks are well built it will turn water nicely, and little damage will be done. Sweet Clover may be cut and allowed to remain in the swath until the second day, but care must be used in handling it, that it does not get too dry and lose the leaves, for they are the most valuable part for feed. It is always best to properly cure hay before stacking or putting in the barn, for if put in too green there is danger of moulding or spontaneous combustion. Fires of this nature are quite common with Clover and Alfalfa, and while the writer does not recall any instances of this complaint in regard to Sweet Clover it no doubt would happen if many barns were filled with it in the green stage.

The second year the hay crop is handled in about the same way, with the exception of cutting. Sweet Clover has been condemned on account of not knowing how to properly handle it. The hay crop could easily be ruined by allowing it to grow too long, for soon after it blooms the stem becomes very hard and woody and is of little value for feed. It is just as necessary to understand Sweet Clover and know its

habits, if a success is to be made in growing it, as it is necessary to know how to handle any other crop. Any one will admit that the wheat crop in many states could be lost if allowed to stand until it has shattered before cutting. The same thing is true with Sweet Clover. When grown by the inexperienced it has been allowed to stand until it bloomed and become a hard, bushy plant of little feed value.

The plant should be cut the second year, at the time it begins to form bloom buds, probably about the middle of June in this latitude. A very important point about cutting Sweet Clover at this time is not to cut it close, or it will die out, and that will be the end of the crop. The fact that it is a biennial should always be kept in mind. It is necessary to cut it quite high, so as to leave some of the branches and leaves, for then it will start up and make a second crop, which can be again cut for hay or allowed to stand and make seed. However, in either case, this ends the plant, and it is necessary to reseed the ground if you wish to continue growing Sweet Clover on the same land. The binder is often used in cutting Sweet Clover, so as not to cut it too low, and when binding it should be bound in small bundles, which may be put into small shocks of three or four bundles each, and there remain until properly cured. It will not take long for the bundles to cure, and it then may be stacked the same as oats or any other grain. Care should be used in handling, so as to retain all the leaf possible, for it is the most valuable part of the hay. The second crop is sometimes pastured lightly, so as to allow part of it to go to seed, and in this way the crop will come on the following year from the seed which has been left on the ground.

There is a wide range when it comes to the quantity of hay that may be produced from an acre, for this varies in different sections and depends quite largely upon weather conditions and fertility of the

soil the same as any other crop. The first year the yield runs from one to two tons per acre of cured hay and the second year the yield will be more, averaging from two to three tons per acre. There are some instances where it has made much larger yields, and if the soil is fertile and there is sufficient moisture a heavier yield may be expected. When tested at the Utah Experiment Station it made more than double the yield of any of the clover or grasses with which it was compared.

The value of Sweet Clover hay is appreciated when it is found by analysis that it contains more digestible protein than Alfalfa hay and it is claimed that a ton of Alfalfa hay is equal to a ton of bran in feeding value; so this puts Sweet Clover at the head of the list when it comes to the real value of its hay.

The chief complaint that is heard in connection with feeding Sweet Clover is that stock refuse to eat it. This is true to a certain extent, but is very easily overcome, and no one need be afraid that their stock is any exception and they will not eat it, for it is only a matter of getting accustomed to it, and after they once form a taste for the hay it will be difficult to keep them from it. Sweet Clover has a bitter taste, due to cumarin, which at first causes animals to refuse to eat it, but it should be remembered that range horses that have never seen corn refuse to eat it, but are just as fond of it as the native horses after once accustomed to it. Stock are not much different from people in this respect, for the writer has the first person to see that likes olives when first tasted, but as a rule most people develop a taste for them. Now, do not gather from this comparison that Sweet Clover is as objectionable in taste to stock as olives are to the average person, for such is not the case, for all kinds of stock, without exception, learn to eat Sweet Clover and prefer it to other feed. (A farmer here in Nevada told me that stock would leave the Alfalfa and brouse

on the dry Sweet Clover that grows here uncultivated and very luxuriantly. E. M. S.) Here is an extract taken from the Farmers' Bulletin on this question: "Shippers of cattle from the arid sections of the west, where corn is unknown, often have difficulty in getting the stock to eat fodder or even corn. The specific instance has come under observation where the cattle were fed corn with the dried husks attached whereupon they ate off the husks and left the corn uneaten. When these same cattle were turned on the green grass the following season instead of eating the new growth they contented themselves with browsing off the dead stalks of the preceding season's growth, which presumably more closely resembled the desert grasses to which they were accustomed."

When cow peas were first tested out the same question of stock eating it came up. It was the belief that stock would not eat it, but it was soon found that such was a mistake. It has also been proven that stock will eat Sweet Clover, and that it is one of the most valuable of the forage crops to the stock grower.

Sweet Clover hay is valued very highly by the dairymen, and they find it makes splendid feed for dairying purposes. The results where it has been tested out are very flattering, and it has been found that the cattle would leave Red Clover hay to eat Sweet Clover. When fed to milch cows it had a tendency to increase the flow of milk, and the cows kept in the best of condition. It gives the milk no unpleasant taste and it is considered an ideal feed for the dairyman, for it contains a large amount of protein and can be produced more cheaply than it can be secured in any other way.

It also makes splendid hay for horses and is much more desirable than Clover hay and is fully equal to Alfalfa hay, and they will eat it just as readily after having been accustomed to it. Sweet Clover hay is

recommended very highly for sheep and young stock of all kinds, and there is no bad effect due to feeding, but on the other hand it keeps stock in good condition and should be considered the greatest feed obtainable.

There is little difficulty experienced in getting stock to eat Sweet Clover hay when properly cured, but should they refuse to eat it when hungry you can overcome this very easily by sprinkling some brine on the hay at about the time they are due to be salted, and this will start them eating it and you will not be required to repeat this operation very often.

Chapter IX

VALUE AS A PASTURE

When Sweet Clover is desired for pasture purposes it is seeded in practically the same manner as for hay, with the exception that more seed is required, in order to obtain a heavy stand. On account of the plant being a biennial it is also necessary to seed the ground the following spring with about half as much seed as was used in the first seeding. A disk drill can be used to advantage seeding this time, or the land may be disked and after the seed is sowed slightly harrowed or dragged. The disking and dragging will not injure the crop already on the ground, and by handling in this manner you should have a permanent pasture, if not pastured too close, for there will be enough go to seed each year to reseed itself and have a continuous stand.

When seeded for pasture Sweet Clover is generally seeded without a nurse crop, for then you can turn the stock on it just as soon as it gets up four or five inches high. It is best to turn the stock upon it while young, for it contains less cumarin and they will learn to eat it without difficulty. It is also well to pasture it, for it causes more shoots to start up, making much better pasture than to allow it to grow up coarse and become woody. The first season it is not necessary to allow it to grow up, for it may be pastured close to the ground, as it will not be damaged and will come on again very early in the spring. One

of the great advantages of Sweet Clover as a pasture is the fact of its coming on earlier in the spring than any other grass, with the possible exception of Alfalfa, and in two weeks' time; on account of its more rapid growth it is even ahead of Alfalfa. The easiest way to have stock become accustomed to eating Sweet Clover is by turning them on to the pasture early in the spring before other green grass has started. By doing this they form an appetite for the plant, eating it with great relish, and you will have no further trouble along this line.

Sweet Clover pasture is adapted to all kinds of stock; horses, cattle, sheep, hogs and chickens do equally well on it. It is better to keep enough stock on the pasture to eat it off closely enough so as to cause it to form an abundance of new shoots, as you will get more feed off the pasture and stock will relish the tender plants much more. But you must remember the second year it is necessary to let it grow up enough in the fall, so as to form seed and re-seed itself. It can be pastured lightly through August and September, but if no seed is allowed to form it will not continue long as a pasture.

There are two great advantages of Sweet Clover as a pasture, and that is it comes on earlier than other green feed and it does not cause bloating of stock as do Clover and Alfalfa. This is due to the cumarin, the bitter principle which the plant possesses, which is of great importance to the stock raiser. Cumarin has been used by druggists and physicians for thousands of years as a corrective, tonic and curative for intestinal disorders, and on this account it is considered extra fine for pasture, as stock keep in the best of health and condition when pasturing on it. Stock make great gains on Sweet Clover pasture. It is fully equal to either Clover or Alfalfa. Another advantage of Sweet Clover is that it will grow on soil that would not grow other grasses sufficiently to secure much

feed. But Sweet Clover will make a good growth on poor soil, affording the best pasture for all kinds of stock and at the same time add humus to the soil, building it up and fertilizing it to such an extent that other crops may be grown successfully when ready to rotate crops. Sweet Clover is to be recommended to the sheep grower, especially of the West, for this plant will grow on thin, barren waste land, enduring the hot, dry summers, and will make a great amount of the best green feed. By careful experiments it has been found that sheep make great gains when allowed to graze upon it, there being no feed better adapted to them.

Sweet Clover is also excellent for hog pasture, as it is more hardy than Alfalfa, easier to secure a stand and will stand more abuse. Close pasturing the first season will do it no harm, and it will come on so very early the second season, making such excellent feed that it is a very paying crop, even if you do not care to continue the pasture as a permanent meadow. You can either re-seed the pasture or allow it to make sufficient growth so as to re-seed itself. No land will bring larger returns to the hog raiser than Sweet Clover, for it is a protein producer—just what the stock grower is looking for.

Another way it can be used to good advantage as a pasture crop, especially for hogs, is by having the field divided and seeding both fields the first year and the second year re-seed one of the fields, so that they will alternate. By turning off one field early, so as to allow it to make growth sufficiently to re-seed itself, the other field can be pastured until late. The next fall reverse the order and allow it to re-seed itself and the former field may be pastured late, and thus alternate the field and have late pasture, as well as early. If desired one field may be turned off early enough to allow it to make a seed crop and generally in harvesting a seed crop there is enough seed that

will shatter out so as to re-seed itself. Then stock may be turned in on the field in the fall, as the tramping will put the seed in the ground, so that it will make a good crop the following year. There is a decided place for Sweet Clover as a pasture and the worth of it in this respect will be appreciated more when the plant is better understood and the method of handling it worked out so as to overcome any objections which might be offered at the present time.

Chapter X

SCIENTIFIC FEED VALUE

There is considerable discussion as to the value of Sweet Clover as a feed, and this point can only be settled to the individual by giving it careful tests and feeding it in comparison with other feeds and watch results. The present growers of Sweet Clover are very enthusiastic and the agricultural writers cannot praise the plant too highly. In this connection it is our desire to give what the government has to say, and a report is here given as contained in Farmers' Bulletin 485: "In common with other legumes Sweet Clover contains a relatively high percentage of protein, thus making it a source of this valuable constituent of farm feeds." Tables 2 and 3 show the relative composition of several different kinds of feed.

TABLE 2. Average percentage composition of Sweet Clover and other forage feeds and value of same per ton.

| KIND OF FORAGE | Number of Analysis | Water | Ash | Protein | Crude Fiber | Nitrogen Free Extract | Ether Extract (Fat) |
|-------------------------|-----------------------|-------|-----|---------|-------------|--------------------------|------------------------|
| Fresh Sweet Clover..... | 7 | 77.0 | 1.8 | 3.9 | 6.9 | 9.4 | 0.6 |
| Fresh Alfalfa | 23 | 71.8 | 2.7 | 4.8 | 7.4 | 12.3 | 1.0 |
| Fresh Red Clover..... | 43 | 70.8 | 2.1 | 4.4 | 8.1 | 13.5 | 1.1 |
| Sweet Clover hay..... | 6 | 7.7 | 7.5 | 18.3 | 26.9 | 42.6 | 2.1 |
| Alfalfa hay | 21 | 8.4 | 7.4 | 14.3 | 25.0 | 42.7 | 2.2 |
| Red Clover hay..... | 38 | 15.3 | 6.2 | 12.3 | 24.3 | 38.1 | 8.3 |
| Timothy hay | 68 | 13.2 | 4.4 | 5.9 | 29.0 | 45.0 | 2.6 |
| Cow Pea hay..... | 8 | 10.7 | 7.5 | 16.6 | 20.1 | 42.2 | 2.2 |

TABLE 3. Digestible nutrients in Sweet Clover and other forage crops and feeds and value of same per ton.

| KINDS OF FORAGE OR FEED | Dry Matter in 100 Pounds | DIGESTIBLE NUTRIENTS IN 100 POUNDS | | | |
|----------------------------|-----------------------------------|---------------------------------------|--------------------|------------------|--------------------------|
| | | Protein | Carbo- hydrates | Ether Extract | Value per Ton Feed |
| Sweet Clover Hay..... | 92.4 | 9.0 | 38.1 | 1.2 | \$18.49 |
| Alfalfa Hay | 91.6 | 11.0 | 39.6 | 1.2 | 20.16 |
| Red Clover Hay..... | 84.7 | 6.8 | 35.8 | 1.7 | 14.12 |
| Timothy Hay | 86.8 | 2.6 | 43.4 | 1.4 | 9.80 |
| Cow Pea Hay..... | 89.3 | 10.8 | 38.6 | 1.1 | 19.76 |
| Wheat Bran | 88.1 | 12.2 | 39.2 | 2.7 | 22.80 |
| Shelled Corn | 89.1 | 7.9 | 66.7 | 4.3 | 20.16 |

The values per pound assigned as the basis of calculation of the value of the digestible nutrients in a ton of the feed as given in table 3 are protein, \$0.0674; carbohydrates (starch, etc.), \$0.0064; ether extract (fats), \$0.0112. These figures are merely relative, as the prices of the food elements vary in different sections of the country and from year to year. It will be noted that the value of Sweet Clover hay on the above basis would be almost double that of timothy and intermediate between red clover and alfalfa, and that the actual market prices of the different feeds bear little relation to their theoretical value.

Feeding Experiments with Sweet Clover

A great many farmers have reported successful experiments in feeding Sweet Clover to live stock, but relatively few of the experimental stations have performed definite feeding experiments to determine the exact value of Sweet Clover hay as compared with other crops. The Wyoming Experiment Station, however, performed an interesting experiment with lambs. A number of pens of from ten to forty lambs each were fed different mixtures of feeds for fourteen weeks. Those receiving Sweet Clover hay, corn and a small amount of oil meal made an average gain of

30.7 pounds per head as compared with 20.3 pounds of those receiving native grass hay, oats and oil meal. Those receiving alfalfa and corn made a gain of 34.4 pounds per head. The details of the experiment with four of the pens of lambs are given in table 4.

TABLE 4. Showing results of feeding tests with lambs.

| RATION | Number of Lambs | Average Gain per Head in lbs. for 14 Weeks | POUNDS OF FEED REQUIRED FOR POUNDS OF GAIN | | | | | Oil Meal (old process) |
|---|--------------------|---|---|---------------|----------------|-------|-------|---------------------------|
| | | | Sweet Clover Hay | Native Hay | Alfalfa Hay | Corn | Oats | |
| Sweet Clover, hay, corn, oil meal | 10 | 30.7 | 637.5 | ..... | ..... | 293.2 | ..... | 20.5 |
| Native grass, hay, oats, oil meal | 40 | 20.3 | ..... | 606.7 | ..... | 460.5 | 25.0 | ..... |
| Alfalfa hay, corn. 10 | 34.4 | ..... | ..... | 557.7 | ..... | ..... | ..... | ..... |
| Alfalfa hay, corn. 40 | 34.8 | ..... | ..... | 557.3 | ..... | ..... | ..... | ..... |

The Sweet Clover hay used in this experiment was stated to be stemmy in its nature and more than a year old. It is of interest to know that in spite of its steminess the hay was eaten up close by the lambs.

At the Iowa Agricultural College a grazing experiment with young shoats was made comparing Sweet Clover and Red Clover. The details of this experiment are shown in table 5.

TABLE 5. Comparative results of pasturing pigs on Sweet Clover and Red Clover.

| KIND OF PASTURE | Number of Pigs per Acre of Pasture | Daily Gain Per Head Pounds | Gain for Entire Lot per Acre Pounds | Grain Required for 100 Pounds of Gain (in addition to pastureage) Pounds |
|-----------------|--|----------------------------------|--|--|
| Sweet Clover | 18 | 1.02 | 2,594 | 338 |
| Red Clover.. | 15 | 1.14 | 2,894 | 338 |

The results of these technical experiments are thoroughly substantiated by numerous private feeding tests in various sections of the country. Hundreds of fat cattle which have been fed almost exclusively on Sweet Clover hay as a roughage in central Utah are marketed annually. From certain sections of western Iowa steers have been turned off fat from Sweet Clover pasture and have brought \$1.00 per hundred weight premium over the ordinary grass pastured stock marketed from the same locality.

In a feeding experiment with sheep, conducted by two students at the Iowa Agricultural College, it was found that the protein digested in Sweet Clover fed alone was 69 per cent, and that the addition of corn to the hay ration increased the digestibility of Sweet Clover to 82 per cent. (See table 6.) Alfalfa and Red Clover showed similar increases in the digestibility of their protein content when corn was added to the ration. The percentage of digestibility figured for the protein in the corn was the average of a number of digestion experiments. The probability is that the digestibility of the corn was also increased by the presence of the hay in the ration, so that not all the increase in the digestibility should be credited to the hay constituents of the different rations.

TABLE 6. Comparative percentage digestible of protein and of dry matter in Sweet Clover, in Alfalfa and in Red Clover.

| RATION | PERCENTAGE DIGESTIBLE | |
|-------------------------|-----------------------|------------|
| | Protein | Dry Matter |
| Sweet Clover— | | |
| When fed alone..... | 69 | 52 |
| When fed with corn..... | 82 | 74 |
| Alfalfa— | | |
| When fed alone..... | 70 | 61 |
| When fed with corn..... | 88 | 75 |
| Red Clover— | | |
| When fed alone..... | 46 | 49 |
| When fed with corn..... | 61 | 61 |

Chapter XI

VALUE AS A FERTILIZER

Sweet Clover undoubtedly has more commercial value as a soil restorative than in any other way. This is the great advantage of the plant, as it can be used in every state in the Union for this purpose, and thus replaces a great amount of wealth which has already been taken from the soil.

One great feature of Sweet Clover is that it grows on all kinds of soil and in all latitudes. While it is good for the Southern farmer it is equally as good for the Northern farmer, and while it adds great wealth to the Eastern farmer with his limestone hills and soil of an acid nature it is fully as good for the Western farmer, with his dry, barren wastes of sand and alkali. Taking the plant as a whole it has no comparison, as it is adapted to a wide range of conditions and will do well for everyone if he will only give it the opportunity. Cow Peas are good for the Southern farmer, but they cannot be grown successfully in the North, as they are a Southern plant. Clover grows well in the eastern half of the United States, but this is not true in the West. Alfalfa grows luxuriantly in the West, but not so well in the East. The Canada Field Pea is adapted to the North, but not to the South; but in Sweet Clover we have a forage crop that grows not only successful all over the United States, North to South, East and West, but is being grown to a greater or less extent all over the world.

Undoubtedly it will soon fill the place which was planned for it when creaetd by the Almighty, and it certainly was not intended to be classed as a weed when it is invaluable both as a feed and a fertilizer.

In the East there are farms which have been abandoned on account of not being able to produce any crops sufficiently large to justify farming. This land lies idle, waiting for nature to replace the elements which have been exhausted. In such cases where land has been completely worn out (not cropped out), and all the nitrogen and humus in the soil exhausted, as well as the lime or calcium, it is rather doubtful whether Sweet Clover alone can ever make good fertile soil; but on the limestone hills or on soil which contains plenty of lime and is not exhausted of its mineral wealth Sweet Clover will replace the nitrogen and humus and unquestionably will build up the land and reclaim the depleted fields which are of apparently little value in their present condition. This is where Sweet Clover will do its greatest good and will meet with a most hearty welcome by all farmers. Not only in the East and South, but throughout the corn belt of the Western States as well, the farmers are beginning to realize that there is need of fertilizing their soil if the most is to be gained from tilling their fields. Clover has been the salvation of the farmer, but this crop is not doing all that could be desired. Often-times there has been much difficulty in obtaining a seeding, and thus on this account rotation of crops has been prevented.

Sweet Clover works in splendidly as a rotation crop, being a biennial the same as Clover, but it is much easier to obtain a stand of it, for it will endure more drouth. The summer of 1911 was very dry, and in most cases Clover was killed by the continuous dry weather after harvest, while sweet Clover withstood the drouth and made a very good growth, affording much fall pasture, and in some instances a hay

crop was secured. Sweet Clover can be sowed in the spring with a nurse crop, and that season you will grow a crop of grain and one crop of Sweet Clover hay. The second year you can cut two crops for hay and plow under the stubble and stems, which add much humus to the soil, as well as replace the nitrogen.

Where the land is very much run down the second crop can be plowed under as a green manure crop. This puts the soil in excellent shape for corn the following season. You can better appreciate Sweet Clover as a green manure crop when you compare it with Mammoth Clover. The Ontario Experimental Station reports having cut thirty tons of green Sweet Clover per acre, as compared with $13\frac{1}{2}$ tons of Mammoth Clover which was considered next best for soiling.

There have been numerous tests made showing the value of Sweet Clover as a fertilizer, and it is considered superior in many ways to all others. At the Ohio Experimental Station a test was made on land which has been sowed to Sweet Clover and a similar field which was not, and the land which had been growing Sweet Clover produced 45 per cent more corn per acre. Similar tests have been made in other places, and it has been found that the same land will produce about 40 per cent more corn when it has been in Sweet Clover than when it has not.

Sweet Clover always accomplishes good when growing on land, no matter what the nature of the soil. When growing on the thin limestone or gravelly hill it is adding fertility to the soil. When it is growing on the clay hill, which has a very compact sub-soil, it not only adds fertility, but has a tendency to break up the hard sub-soil by its great root system and to open up the ground and establish humus below the surface. Thus the ground is in a better position to grow all kinds of crops, and especially Alfalfa, as its roots will not penetrate a hard sub-soil, and for

this reason in many places it cannot be grown successfully. When Sweet Clover grows on land which is inclined to be wet or bottom land, commonly known as gumbo, it also has a remedial effect. It has a tendency to open up the soil and let the water go down and dry out the land, which is very important. In the West it will grow on the soil which is strongly impregnated with Alkali, relieving it of that condition, so that after a crop or two of Sweet Clover has been grown on such soil some other field crop may be raised successfully.

We find Sweet Clover being used most extensively as a fertilizer in the South and Alabama, Mississippi and Kentucky are states growing it extensively as a field crop, and the demand is rapidly spreading and other states are taking it up. The results are so apparent and satisfactory that it requires only a knowledge of their success to cause an unusual demand. It is reclaiming vast areas of old, worn-out land which has been cropped to death by continuous farming. One cannot speak too highly of its success. The experience of the Southern farmer in this regard is unquestionable proof as to the value of the plant as a fertilizer. It is estimated that it produces as much nitrogen and humus making material as is contained in twenty-five loads of average farm manure.

Sweet Clover is growing in many places on lands which refuse to grow other leguminous plants, and this is the reason it is hailed with such delight. It is the Clover for all purposes, without any restrictions. To fully appreciate the worth of Sweet Clover as a fertilizer all that is required is to sow it on worn-out land and watch closely the results. Here is an extract from the government bulletin: "As an instance of its effect on land it may be mentioned that in Alabama on poor, run-down soil it produced 6,672 pounds of hay per acre the first year and 7,048 pounds the second year, after which the stubble was plowed under and

planted to corn. The corn produced 22.7 bushels per acre, as compared with 16.2 bushels per acre upon an adjoining plat where Sweet Clover had not been grown. The year following a similar experiment in the same section showed the corn to have yielded 28.2 bushels on the Sweet Clover stubble land, as compared with 21.2 bushels where cotton instead of Sweet Clover preceded the corn. A total of 11,376 pounds of hay had been cut from the Sweet Clover plats during its two seasons of growth."

Sweet Clover has one more advantage which is worthy of mention and should not be overlooked. It has proven itself a splendid fertilizer, but it also holds the soil and prevents washing. Fields which have been washing and were fast becoming badly cut up by ditches and gullies have been saved by sowing with Sweet Clover. By leaving the fields in Sweet Clover pasture or hay a few years washing was stopped and by a natural process fields have been reclaimed which would have become practically ruined by unsightly ditches and gulies.

Chapter XII

VALUE AS A SEED CROP

In very few parts of the country is Sweet Clover grown for a seed crop, although at the present time it would be a very profitable crop, since there is an enormous demand for seed. The production of seed has been insufficient to supply the demand and at times it has been very difficult to obtain seed for sowing. It is not a difficult task to grow the seed, and it will only be a short time until this part of the industry will be given more attention.

In growing Sweet Clover it is essential to select the proper species. The demand is largely for the White Blossom Sweet Clover, although there is some demand for the Yellow Blossom. Both are biennial plants, but care should be taken in not confusing the Large Yellow Blossom with the small species known as Indian Sweet Clover, an annual, and not desirable except possibly for special purposes or sections.

Sweet Clover is now grown for seed in only a few localities, and we find the White Blossom being grown in Alabama, Mississippi and Kentucky, Iowa, Kansas, Nebraska and several of the Western States, and to a limited extent in Utah. These states are now producing about all the seed that is offered on the market, but it need not be so, for it will grow and make seed in all states. The Sweet Clover found growing along the roadsides in Iowa is very full of

seed and would yield splendidly if harvested as a seed crop. At the present time the Yellow Blossom is grown principally in Kentucky and Colorado and the small Yellow Annual is grown mostly in southern California and possibly in a few of the other Western States.

When growing Sweet Clover for seed it is better not to sow too thickly, for large yields are obtained. The seed crop is produced the second year, and either the first or second crop may be harvested for seed. It is the writer's experience that in the state of Iowa a larger seed crop may be secured from the first crop, but in harvesting it for seed there is also danger of killing the plant, for if it is well matured and not cut quite high the plant will die. However, in the South the second crop is in most cases utilized for seed.

Sweet Clover does not all ripen at the same time, for there will be matured seed on the plant while it is still blooming, and for this reason it is a little hard to always know just the proper time for cutting. It should not be allowed to get too ripe, for the seed is inclined to shatter, and it is best to cut while the dew is on or after a shower. In the South it is the common practice to place the Clover in piles and later flail out the seed with sticks on a canvas, but this mode of treatment leaves the hull on the seed, making it less desirable than the hulled seed. However, the hull can be removed by running through a clover huller, or threshing machine with special concaves; and where a clover huller is available it is best to use it in hulling the Sweet Clover, although the hay is a little coarse and difficult to run through a huller, but if there is not too much stem it can be hulled with a machine. The straw after it has been threshed may be returned to the field for fertilization or it may be used as feed for stock.

The yield of seed varies from five to fifteen bushels per acre, depending whether hulled or unhulled. The seed should be well cleaned before being put on

the market, for there is always much inert matter and shrunken seeds which should be removed, for they are practically useless for seeding. The hulled seed is preferable and is generally demanded by most seeds-men. Thus in growing Sweet Clover for market it would be well to provide a huller, so that the most may be gotten out of the crop. The hulled seed gives better results when sowed, for it germinates more readily and often the unhulled seed will not germinate the first season, but remain in the ground until the second year.

Since the plant is a prolific seed producer it is easy to see that there is good money in growing it for seed purposes. The market price varies, but of late years the White Blossom hulled, has been selling from \$15.00 to \$20.00 per hundredweight, being higher in price than Alfalfa. The price of the seed should be about the same as Alfalfa seed, but the market will fluctuate from time to time, depending upon the quantity produced and the demand.

From the testing of samples it has been found that the northern seed is preferable to the southern grown, since it is of stronger vitality and germinates more readily. In the southern grown there is a large percent of hard seed which fail to germinate the first season. Considerable Sweet Clover seed has been imported and the foreign seed gives very good results, showing a good per cent of germination and is adapted to our climate. One thing necessary to watch when buying foreign seed of any kind is not to get some noxious weed and introduce some pest which might be very hard to eradicate.

The Yellow Annual Sweet Clover is offered more freely on the market, as it is sort of a by-product of the Western farmer. It is screened out of their grain and thus being produced very cheaply it is offered at much lower prices than either one of the White or Yellow biennials. Whenever the Yellow Blossom is offered at a low price it would be well to investigate

before buying and ascertain whether it is the true biennial which is being offered you. The difference can easily be distinguished, for the annual seed is rough, while the biennial is smooth when it is hulled.

Chapter XIII

WHERE TO OBTAIN SEED

Sweet Clover seed may be obtained from most any reputable seed company, although it is only of late years that seedsmen have begun to handle it in quantities. It is very important for the buyer to know what species he wants and then see that he gets it. Some seedsmen have not given Sweet Clover the study it deserves and are not familiar with the different species and do not know the value of each, so are not in a position to give their customers proper information or furnish the variety best adapted to their requirements.

If you write for prices on Yellow Blossom Sweet Clover see that you get a sample and a price on the biennial and not the annual, for as previously stated the annual has less commercial value.

There is one reputable Seed House that has made Sweet Clover a special study and on this account are best prepared to serve their customers and are the largest handlers of seed, selling from 15 to 20 cars during a season. I refer to the A. A. Berry Seed Company, Clarinda, Iowa, and take pleasure in recommending this concern to everyone who intends to sow Sweet Clover. They are very progressive and are in close touch with all growers of seed and try to handle only a high grade that should give the best of satisfaction.

Furthermore, they are prepared to scarify all of their seed and the writer wishes to emphasize the importance of treated seed. You will find that the germination of their scarified seed has been greatly increased and is by far the best seed to sow. Scarifying does not only increase the germination, but makes a crop much more certain, as it germinates quicker and grows a stronger and healthier plant. You can sow a half less scarified seed to the acre and be assured of a better stand. If you write for prices of Hulled Seed, make sure it is properly scarified. Don't be contented with anything else.

Don't ever use Southern grown seed, as it is not nearly as satisfactory and the unhulled seed sold by the Southern seedsmen is to be condemned and the use of it discouraged.

It is best to secure the hulled seed when possible, for it germinates more readily and gives better satisfaction and the difficulty sometimes experienced in obtaining a stand will be avoided.

The writer is familiar with a party who sowed thirty acres in Iowa and a good stand was obtained on the twenty acres, which were sowed with the hulled seed, but the ten acres which were sowed with unhulled seed, secured from a Southern dealer, proved a failure. It is very essential that first-class seed be obtained if a good stand is to be expected.

Since there is an unusual interest created and so many starting to grow Sweet Clover the seed proposition is one of special interest. Anyone wishing seed should make arrangements early in the season, for, as a rule, seed can be bought to better advantage then and if purchasing is delayed until the time of sowing difficulty might be experienced in securing seed. Such has been the experience of late years, but it may be that this will soon be overcome by a large number harvesting seed.

Chapter XIV

ERADICATION

With the many advantages credited to Sweet Clover there is another point which should be covered—the eradication or extermination of the plant. It is claimed by some that Sweet Clover is hard to eradicate and trouble along this line is anticipated. The fact that Sweet Clover is a biennial plant is proof that it should not be hard to eradicate, for if it is not allowed to seed it cannot exist more than two years.

In changing land from Sweet Clover to a cultivated crop it would be well to follow with a corn crop, for by careful cultivation and not allowing any to go to seed it will not show up after the second year, except possibly an occasional plant which has come from hard seed that has remained in the ground. Two years of cultivation will practically remove all trace of it, and no one need experience any serious difficulty along this line, as it is not considered hard to eradicate.

The sod is not hard to break, being easily accomplished with any plow that is sharp, so as to cut off the tap root. The sod is not of a tough nature, but on the other hand breaks up when plowed, making it easily put in condition for a corn crop.

The difficulty experienced in eradicating Sweet Clover along the roadside has been due to the fact that in many cases it was not cut until seed had

ripened, and thus allowed to re-seed itself, or it was cut too high and the branches started up again and made sufficient growth to produce seed. If Sweet Clover is cut low with a mower before it has been allowed to form seed the plant will die and cause no further trouble. This should be remembered, for if you are cutting it for hay and wish it to come again sufficient branches should be left so that it will start.

Sweet Clover seldom ever enters the cultivated fields, and when it is growing in the fence rows it does not bother an adjoining cultivated field. It is much better to have Sweet Clover growing in waste places than any weed, for not only is it improving the soil, but is also preventing noxious weeds from gaining a foothold.

Chapter XV

CONCLUSION

When writing about Sweet Clover in a general way there are bound to be some exceptions and differences of opinion. However, the writer does not expect everyone at present to agree as to the value of the plant, but time will impress upon all of us its real merits. As it becomes more generally grown and understood, regardless of the skeptic's opinion, who may condemn the plant, the fact remains that Sweet Clover is one of the great forage plants. It will not, however, do away with a single plant that we are now growing. There is already a place for Sweet Clover on nearly every farm, since the crops we are now producing do not meet all the requirements. Thus we see the need is present and it is only a matter of Sweet Clover finding its place.

Where Alfalfa can be grown to best advantage Sweet Clover will not appeal to the farmer in that particular section, while on the other hand to the many who have been unsuccessful in growing Alfalfa, Sweet Clover will find a welcome. The fact that Sweet Clover can be grown in all sections and on nearly all soils makes it stand without a peer as a utility crop, as it can be depended on to make good where other crops fail.

Sweet Clover especially recommends itself to the dairy farmer, being very rich in protein, affording splendid pasture, and making the very best of hay

that will rank alongside of Alfalfa. In many sections it is almost impossible to get Alfalfa hay, as every dairyman knows; therefore there is a great need for some other crop to take its place. To the eastern dairyman it should find a very warm welcome, for it will not only put him on par with the western farmer in producing feed, as the hills will grow the very best kind of crops and produce an abundance of feed, containing a high per cent of protein, just what he desires, and at the same time will also build up the land, so that it will bring him a two-fold income.

The fact that the merits of Sweet Clover are not generally known makes it of no less value or importance. Nor is it so strange that the value of Sweet Clover is not known to the farmer of the United States, with all of his knowledge and advancement in the agricultural pursuit, for he was practically as long in realizing that Alfalfa was the greatest forage crop that could be grown, although it had been grown for thousands of years in Asia and was a very popular crop in Europe for a great many centuries, while it did not gain widespread popularity in the United States until the twentieth century. Even in Old Mexico, where they have their ox carts and are very slow in adopting new ideas, they realized the value of Alfalfa and have grown it as a forage crop for over 200 years. It is to Mexico that we are indebted for introducing it in the United States, for it was first introduced into California, and from there it gradually worked east, in a roundabout way, until it finally penetrated to the grain and dairy districts of the middle west. The mere fact that Alfalfa was not grown by the farmers in the United States made it of no less value. The same is true of Sweet Clover. The value of Sweet Clover will be realized when it has been developed, the crop understood and it becomes more generally grown. It is adapted to a great variety of soil and will add much wealth in the way of feed and in enriching the soil,

which is so much in need of something that can be used advantageously for rotation of crop.

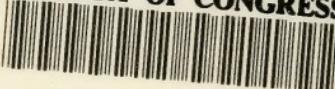
In many sections Alfalfa is not grown and is understood but little more, if any, than Sweet Clover. It is to the thinking and progressive farmer that Sweet Clover will appeal. There certainly is a big demand for a plant that has such true worth and has so many points in its favor, recommending itself to the farmer of the East, West, North and South; to the cattle and sheep raiser of the West; to the feeders and corn growers of the central states; to the dairyman and farmer of the East and to the Southern farmer, who is so much in need of a fertilizer.

Heretofore the importance of forage plants has not been recognized and many have thought that the plow and the planter were the only producers of values, while the truth is that our forage plants are of more value than the cereal crops of all kinds, and the profit from cattle, hogs, sheep and poultry comes from the pasture and hay, rather than from the crib or granary. If our forage plants failed but a single season it would bring complete disaster to every farmer and but a small per cent of stock of all kinds would survive. This fact is appreciated to some extent after a hard and long winter, when the feed supply is practically exhausted and every farmer is anxiously awaiting the green pasture on which to turn the stock. It is to the green feed that we must look largely for the profit that is to be derived out of stock of all kinds.

It is truly wonderful to study the feed proposition and see how nature has so generously provided the green feed which is of such great importance to every stock grower. We find the green fields of Clover, Alfalfa, Timothy, Blue Grass and grasses of various kinds, and now we have another important crop added to our resources—the Sweet Clover—which bids fair to take its true place among the principal crops.

Undoubtedly as the years roll by and when farming becomes a scientific study rather than a mere routine Sweet Clover will be counted in many sections of the country as the great money-making crop, and will be recognized by all as one of the most valuable of forage plants.

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